

with virtual object(s) in a mixed reality space including a virtual space and real space comprising:

viewpoint detection program step for detecting the location/posture of a viewpoint of the operator;

geometric information acquisition program step for acquiring geometric information of real object(s);

recognition program step for recognizing a current relative relationship between the virtual object(s) and real object(s);

a rule memory for storing rules for controlling the action of the virtual object(s);

computation program step for determining the next action of the virtual object(s) in accordance with the rules stored in said rule memory and in correspondence with the location/posture of the real object(s), and computing the location/posture of the virtual object(s) after the determined action; and

presentation program step for generating at least one image of the virtual object on the basis of the location/posture of the virtual object(s) after the action and the location/posture of the viewpoint position of the operator, and for representing the mixed reality space to the operator by superimposing the image(s) of the virtual object(s) on the operator's view of the real space.

REMARKS

Applicants request favorable reconsideration and allowance of this application in view of the foregoing amendments and the following remarks.

Claims 1-39 are pending in this application, with Claims 1, 20, and 39 being independent.

Claims 1-9, 11-18, 20-28, 30-37, and 39 have been amended. Applicants submit that support for these amendments can be found in the original disclosure, and therefore no new matter has been added.

Claims 2, 3, 5-7, 14, 15, and 20-38 were rejected under 35 U.S.C. §112, second paragraph, as allegedly being indefinite. The claims have been amended in light of the Examiner's comments, and Applicants submit that the Examiner's objections have been overcome. Favorable reconsideration and withdrawal of the rejection are sought.

Claims 1-11, 14, 15, 17-19, 20-30, 33, 34, and 36-39 were rejected under 35 U.S.C. §102 as being anticipated by U.S. Patent No. 5,577,981 (Jarvik). Claims 12, 13, 16, 31, 32, and 35 were rejected under 35 U.S.C. §103 as being obvious over Jarvik. Applicants respectfully traverse these rejections for the reasons discussed below.

As recited in independent Claim 1, the present invention relates to a simulator apparatus having, *inter alia*, computation means for determining a next action of virtual object(s) in accordance with rules stored in a rule memory and in correspondence with the location/posture of real object(s), and computing the location/posture of the virtual object(s) after the determined action. Through this feature, virtual object(s) are not only controlled to change in response to an operator's operation, but also the next action of the virtual object(s) is controlled in accordance with both the rules stored in a rule memory and the location/posture of real object(s).

Reaction

Applicants submit that Jarvik fails to disclose or suggest at least this feature. That patent is essentially directed to a virtual reality exercise machine for a single user.

The exercise machine varies a virtual image to be presented to an operator based on the movement/posture of the operator and an operation by the operator. (However, it does not vary a virtual object based on a combination of a stored rule and the location/posture of a real object. X

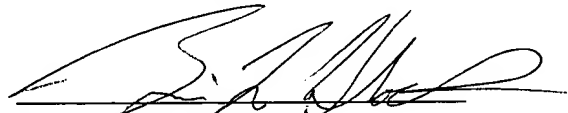
Accordingly, Applicants submit that Claim 1 is patentable over Jarvik.

Claims 20 and 39 recite similar features and are believed allowable based on similar distinctions over Jarvik.

For the foregoing reasons, Applicants submit that this application is in condition for allowance. Favorable reconsideration, withdrawal of the outstanding rejections, and an early Notice of Allowance are requested.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below-listed address.

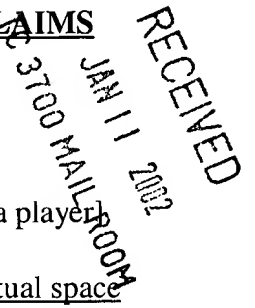
Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE TO THE CLAIMS



1. (Amended) A simulator [game] apparatus with which an operator [a player] plays a simulation [game] with virtual object(s) in mixed reality space including a virtual space and real space, said simulator comprising:

viewpoint detection means for detecting the location/posture of a viewpoint of the operator [player];

geometric information acquisition means for acquiring geometric information of real object(s);

recognition means for recognizing a current[,] relative relationship between the virtual object(s) and real object(s);

a rule memory for storing rules for controlling the action of the virtual object(s);

computation means for determining the next action of the virtual object(s) in accordance with the rules stored in said rule memory and in correspondence with the location/posture of the real object(s), and computing the [thee] location/posture of the virtual object(s) after the determined action; and

presentation means for generating at least one [of] image of the virtual object(s) on the basis of the location/posture of the virtual object(s) after the determined action and the location/posture of the viewpoint position of the operator [player], and for representing the mixed

reality space to the operator [player] by superimposing the image(s) of the virtual object(s) [image(s)] on the operator's [player's] view of the real space.

2. (Amended) The [A game] apparatus according to claim 1, wherein said presentation means further comprises [comprising]:

image-capturing means for capturing real space images of said operator's [player's] view of real space images of said player's view of the real space;

image generation means for generating mixed reality images representing [of] the mixed reality space by superimposing or overlaying said image(s) of the virtual object(s) [image(s)] on said real space images; and

a video see-through type display means that the operator wears [player wears] wherein said mixed reality images are displayed.

3. (Amended) The [A game] apparatus according to claim 1, wherein said presentation means further comprises an [comprising, An] optical see-through type display means that the operator wears [player wears] wherein said virtual object image(s) are displayed.

4. (Amended) The [A game] apparatus according to claim 1, further comprising, status detecting means for detecting status of the operator [player];
wherein said computation means determines a next action of the virtual object in accordance with the rule stored in said rule memory and in correspondence with the

location/posture of the real object and/or the status of the operator, and computing a location/posture of the virtual object after the determined action.

5. (Amended) The apparatus according to claim 1, wherein the current [,] relative relationship includes a layout relationship between the virtual object and real object at the current [that] time in the mixed reality space.

6. (Amended) The apparatus according to claim 1, wherein the current [,] relative relationship includes a behavior of the real object with respect to the virtual object at the current [that] time in the mixed reality space.

7. (Amended) The apparatus according to claim 1, wherein the real object includes the operator [player] himself or herself, and said recognition means recognizes a current [,] relative relationship between the virtual object and the operator [player].

8. (Amended) The apparatus according to claim 1, wherein the real object includes a plurality of operators [players] who operate said simulator [game] apparatus, and the plurality of operators [players] share a single mixed reality space.

9. (Amended) The apparatus according to claim 1, wherein the real object is an object which is fixed in position, and

said geometric information acquisition means comprises:

a predetermined memory for pre-storing location information and shape information of the real object; and

means for reading out the location information and shape information of the real object from said predetermined memory as needed.

11. (Amended) The apparatus according to claim 1, wherein the real object is an operator [a player], and

said geometric information acquisition means comprises:

a sensor for detecting a location/posture of a head of the operator [player];

and

means for setting a region having a fixed, known shape that approximates the operator [player] in the mixed reality space in accordance with the detected location/posture of the operator's head.

12. (Amended) The apparatus according to claim 1, wherein when the simulation [game] is a battle simulation [game] with the virtual object, an objective is to decrease an expected score of the operator [player].

13. (Amended) The apparatus according to claim 1, wherein when the simulation [game] is a cooperative simulation [game] with the virtual object, an objective is to increase an expected score of the simulation [player].

14. (Amended) The apparatus according to claim 1, wherein one of the rules stored in said rule memory controls the action of the virtual object on the basis of an objective of the simulation [game] and a relative relationship between the virtual object and real object.

15. (Amended) The apparatus according to claim 1, wherein one of the rules stored in said rule memory expresses the action of the virtual object as an action pattern with a predetermined aim for achieving an [the] objective of the simulation.

16. (Amended) The apparatus according to claim 15, wherein the pattern has a path disadvantageous to the operator [player] in consideration of a layout relationship between the virtual object and real object.

17. (Amended) The apparatus according to claim 11, wherein when the operator [player] is one of the real objects, an output from said viewpoint detection means for detecting the location/posture of the viewpoint of the operator [player] is also used as information which is to be acquired by said geometric information acquisition means and pertains to a location and shape of the operator [player].

18. (Amended) The apparatus according to claim 1, wherein said viewpoint detection means detects a location/posture of the [a] head of the operator [player], and
said apparatus further comprises detection means for detecting a location/posture of a hand of the operator [player]; and
means for recognizing a relative location of the hand of the operator [player] with respect to the head as a command on the basis of an output from said detection means.

20. (Amended) An image processing method for a simulator [game] apparatus with which an operator [a player] plays a game with virtual object(s) in a mixed reality space comprising:
viewpoint detection step for detecting the location/posture of a viewpoint of the operator [player];
geometric information acquisition step for acquiring geometric information of real object(s);
recognition step for recognizing a current [,] relative relationship between the virtual object(s) and real object(s);
[a rule memory for storing rules for controlling the action of the virtual object(s);]
computation step for determining the next action of the virtual object(s) in accordance with the rules stored in a [said] rule memory, which stores rules for controlling the action of the virtual object(s), and in correspondence with the location/posture of the real

object(s), and computing the [thee] location/posture of the virtual object(s) after the determined action; and

presentation step for generating at least one [of] image of the virtual object(s) on the basis of the location/posture of the virtual object(s) after the determined action and the location/posture of the viewpoint position of the operator [player], and for representing the mixed reality space to the operator [player] by superimposing the image(s) of virtual object(s) [image(s)] on the operator's [player's] view of the real space.

21. (Amended) The method according to claim 20, wherein the operator wears [player wears] a video see-through type display, and said presentation step further comprising, image-capturing step for capturing real space images of said operator's [player's] view of the real space;

image generation step for generating mixed reality images representing of the mixed reality space by superimposing or overlaying said image(s) of virtual object(s) [image(s)] on said real space images and for displaying said mixed reality images on the display.

22. (Amended) The method according claim 20, wherein the operator wears [player wears] an optical see-through type display and said presentation step representing the mixed reality space to the operator [player] by displaying the image(s) of virtual object(s) [image(s)] on the display.

23. (Amended) The method according to claim 20, further comprising,
status detecting step for detecting status of the operator [player];
wherein said computation step determines a next action of the virtual object in
accordance with the rule stored in said rule memory and in correspondence with the
location/posture of the real object and/or the status of the operator, and computing a
location/posture of the virtual object after the determined action.

24. (Amended) The method according to claim 20, wherein the recognition step
recognizes the current[,] relative relationship including [includes] a layout relationship between
the virtual object and real object at the current [that] time in the mixed reality space.

25. (Amended) The method according to claim 20, wherein the recognition step
recognizes the current[,] relative relationship including [includes] a behavior of the real object
with respect to the virtual object at the current [that] time in the mixed reality space.

26. (Amended) The method according to claim 20, wherein [the real object
includes the player himself or herself, and] the recognition step includes the step of recognizing a
current[,] relative relationship between the virtual object and the [player.] operator, and the real
object includes the operator himself or herself.

27. (Amended) The method according to claim 20, wherein [the real object includes a plurality of players who operate the game apparatus, and the] a plurality of operators [players] share a single mixed reality space and the real object(s) used in the computation step includes a plurality of operators who operate the apparatus.

28. (Amended) The method according to claim 20, wherein the real object is an object which is fixed in position, and
the geometric information acquisition step includes the steps of:
pre-storing location information and shape information of the real object in a predetermined memory; and
reading out the location information and shape information of the real object from the predetermined memory as needed.

30. (Amended) The method according to claim 20, wherein the real object is an operator [a player], and
the geometric information acquisition step includes the steps of:
detecting a location/posture of the [a] head of the operator [player]; and
setting a region having a fixed, known shape that approximates the operator [player] in the mixed reality space in accordance with the detected location/posture of the head.

31. (Amended) The method according to claim 20, wherein when the simulation [game] is a battle simulation [game] with the virtual object, an objective used in said computation step is to decrease an expected score of the operator [player].

32. (Amended) The method according to claim 20, wherein when the simulation [game] is a cooperative simulation [game] with the virtual object, an objective used in said computation step is to increase an expected score of the operator [player].

33. (Amended) The method according to claim 20, wherein one of the rules controls the action of the virtual object on the basis of an objective of the simulation [game] and a relative relationship between the virtual object and real object.

34. (Amended) The method according to claim 20, wherein one of the rules stored in the rule memory expresses the action of the virtual object as an action pattern with a predetermined aim for achieving the objective of the simulation.

35. (Amended) The method according to claim 34, wherein said computation step determines an action using a [the] pattern having [has] a path disadvantageous to the operator [player] in consideration of a layout relationship between the virtual object and real object.

36. (Amended) The method according to claim 30, wherein when the operator [player] is one of real objects, said geometric information acquisition step uses an output from said viewpoint detection step of detecting the location/posture of the viewpoint of the operator that [player as information which is to be acquired in the geometric information acquisition step and] pertains to a location and shape of the operator [player].

37. (Amended) The method according to claim 20, wherein the viewpoint detection step includes the step of detecting a location/posture of the [a] head of the operator [player], and

said method further comprises the detection step of detecting a location/posture of a hand of the operator [player]; and

the step of recognizing a relative location of the hand of the operator [player] with respect to the head as a command on the basis of an output in the detection step.

39. (Amended) A storage medium which stores a program of an image processing method for a simulator [game] apparatus with which an operator [a player] plays a simulation [game] with virtual object(s) in a mixed reality space including a virtual space and real space comprising:

viewpoint detection program step for detecting the location/posture of a viewpoint of the operator [player];

geometric information acquisition program step for acquiring geometric information of real object(s);

recognition program step for recognizing a current[,] relative relationship between the virtual object(s) and real object(s);

a rule memory for storing rules for controlling the action of the virtual object(s);

computation program step for determining the next action of the virtual object(s) in accordance with the rules stored in said rule memory and in correspondence with the location/posture of the real object(s), and computing the [thee] location/posture of the virtual object(s) after the determined action; and

presentation program step for generating at least one [of] image of the virtual object on the basis of the location/posture of the virtual object(s) after the action and the location/posture of the viewpoint position of the operator [player], and for representing the mixed reality space to the operator [player] by superimposing the image(s) of the virtual object(s) [image(s)] on the operator's [player's] view of the real space.